

Docket No. 501.39158CX1
Serial No. 10/770,413
Office Action dated March 28, 2005

REMARKS

I. Introduction

By the present Amendment, claims 1, 7, and 13 have been amended. No claims have been added or cancelled. Accordingly, claims 1-18 remain pending in the application. Claims 1, 7, and 13 are independent.

II. Office Action Summary

In the Office Action of March 28, 2005, claims 1-18 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,327,022 issued to Nishi, in view of U.S. Patent 5,532,114 issued to Bae. These rejections are respectfully traversed.

III. Rejections Under 35 USC §103

Claims 1-18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nishi in view of Bae. In support of this rejection, the Office Action indicates that Nishi discloses an exposure method wherein first and second exposures are performed on a substrate using UV light. The reticles of Nishi are also described as including hole patterns and line patterns. The Office Action admits that Nishi does not disclose the reticles being phase-shifting masks, and that the phase of the second phase shift mask is inverted from that of the first phase shift mask. The Office Action relies on Bae for disclosing the use of first and second phase shift masks in the first and second exposure processes, and that the first and second phase shift masks "include shifters (phase shift pattern) formed on the mask substrate." Further, the Office Action indicates that Bae discloses the

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second phase shift mask having a phase that is inverse to that of the first phase shift mask.

As amended, independent claim 1 defines a method of manufacturing semiconductor integrated circuit devices that comprises, in part, the steps of:

(c) exposing a first phase shift mask pattern having phase errors or random defects on a first region of the main surface of the wafer mounted on the wafer stage by reduction projection exposure using ultraviolet light; and

(d) after the step (c), exposing a second phase shift mask pattern formed over the same main surface of the same wafer as the first phase shift mask pattern, on the first region of the main surface of the wafer mounted on the wafer stage by reduction projection exposure using ultraviolet, the second phase shift mask pattern having phase errors or random defects;

wherein the first phase shift mask pattern has a first layout pattern comprising a plurality of hole patterns and a hole pattern surrounded by auxiliary patterns,

wherein the second phase shift mask pattern has a second layout pattern comprising a plurality of hole patterns and a hole pattern surrounded by auxiliary patterns,

wherein the first layout pattern is the same as the second layout pattern, and

wherein a phase of the light passing through each hole pattern of the first layout pattern is inverted from a phase of the light passing through each hole pattern of the second layout pattern corresponding to the hole pattern of the first layout pattern.

According to independent claim 1, a first phase shift mask pattern is used to expose the wafer using ultraviolet light. Next, a second phase shift mask pattern is used to expose the wafer using ultraviolet light. The first and second phase shift mask patterns have respective first and second layout patterns containing a plurality of hole patterns and a hole pattern surrounded by auxiliary patterns. Furthermore, The first and second layout patterns are also the same, i.e., identical. The phase of light passing through hole patterns in the first layout

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pattern, however, are inverted from the phase of light passing through the corresponding hole patterns in the second layout pattern.

In order to support a rejection under 35 U.S.C. §103, a *prima facie* case of obviousness must be made. According to the Federal Circuit and the M.P.E.P., a *prima facie* case of obviousness requires that three basic criteria be met. First, there must be some suggestion or motivation in the primary reference to modify, combine, or seek out the teachings of a secondary reference. Second, there must be a realistic expectation of success from combining the two references. Finally, the prior art references must clearly teach or suggest all the claim limitations. See M.P.E.P. §706.02(j). The Federal Circuit has consistently supported the requirements of the M.P.E.P. in stating, for example, that "[i]n proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a *prima facie* case of obviousness based upon the prior art." In re Fritch, 972 F.2d 1260, 23 USPQ 2d 1780 (Fed. Cir. 1992).

As indicated in the Office Action, Nishi fails to disclose features such as the reticles being phase-shift masks and that the phase of the second phase shift mask is inverted from that of the first phase shift mask. Contrary to the Office Action's allegations, however, Bae does not disclose key features recited in independent claim 1. For example, Bae does not disclose the phase of light passing through the first phase shift mask being inverted from that of light passing through the second phase shift mask. In fact, review of the passage cited in the Office Action (column 1, lines 58-62 of Bae) appears to suggest the contrary. Bae indicates that the arrangement of chromium and phase shift quartz patterns on the second photo mask are reversed from the arrangement on the

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first photo mask. Specifically, it is the physical positions of the chromium and phase shift quartz patterns that are reversed in order to control the number of times specific portions of the wafer receive light during a multi-exposure process. This reversal, however, has no effect on the actual phase of the light passing through the patterns. There is simply no disclosure or suggestion for inverting the phase of light passing through hole patterns in the first layout pattern relative to light passing through corresponding hole patterns in the second layout pattern.

Additionally, since the arrangement of chromium and phase shift quartz patterns are reversed, the layout patterns of the two masks are necessarily different. This is illustrated in Fig. 2A and Fig. 2B where different portions of the wafer receive different levels of light exposure depending on the particular photo mask used. There is simply no disclosure or suggestion, in Bae, for two phase shift mask patterns wherein "the first layout pattern is the same as the second layout pattern." Similarly, Bae fails to disclose or suggest two phase shift mask patterns having first and second layout patterns, wherein "a phase of the light passing through each hole pattern of the first layout pattern is inverted from a phase of the light passing through each hole pattern of the second layout pattern corresponding to the hole pattern of the first layout pattern."

In the present case, Nishi and Bae both fail to disclose various limitations recited in independent claim 1. Additionally, these limitations are not suggested by the references taken alone, or in combination. Consequently, there is no motivation to combine the references with a realistic expectation of success.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

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Claims 2-6 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Independent claims 7 and 13 define different methods of manufacturing semiconductor integrated circuit devices that are somewhat similar to independent claim 1. Specifically, these claims expose a wafer using first and second phase shift masks wherein:

wherein the first phase shift mask pattern has a first layout pattern comprising a plurality of hole patterns and a hole pattern surrounded by auxiliary patterns,

wherein the second phase shift mask pattern has a second layout pattern comprising a plurality of hole patterns and a hole pattern surrounded by auxiliary patterns,

wherein the first layout pattern is the same as the second layout pattern, and

wherein a phase of the light passing through each hole pattern of the first layout pattern is inverted from a phase of the light passing through each hole pattern of the second layout pattern corresponding to the hole pattern of the first layout pattern.

As previously discussed with respect to independent claim 1, the features recited above are not disclosed or suggested by the art of record. It is therefore respectfully submitted that independent claims 7 and 13 are allowable over the art of record.

Claims 8-12 depend from independent claim 7, and claims 14-18 depend from independent claim 13. Accordingly, these claims are also believed allowable for at least the reasons set forth above with respect to independent claims 7 and 13. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

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IV. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, a Notice of Allowance is believed in order, and courteously solicited.


If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

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AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 501.39158CX1).

Respectfully submitted,
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September 28, 2005